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Claims PTO

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AMW

1. A method for ultra-fast conversion of time signal into two-dimensional space signal wherein a signal light pulse and a reference ultra-short light pulse having an appropriate width in space are introduced into a nonlinear crystal through a dispersion device and an one-dimensional Fourier transformation optical system, a second-harmonic which is generated by satisfying phase matching condition in the nonlinear crystal is subjected to time-to-space conversion through an inverse one-dimensional Fourier transformation optical system so as to be converted into an one-dimensional space distribution, the time-to-space converted one-dimensional space distribution is subjected to filtering with a time-frequency filter provided on a filter plane of an one-dimensional space frequency filtering optical system, and a time-frequency expanded two-dimensional light distribution representing a relation between time and frequency of the signal pulse light is regarded as a two dimensional space signal.

2. A method for ultra-fast conversion of time signal into two-dimensional space signal wherein a signal light pulse and a reference ultra-short light pulse having an appropriate width in space are introduced into a dispersion device at angles symmetric with respect to optical axis, light waves from the signal light pulse and the reference ultra-short light pulse which are dispersed due to a time difference generated by a

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difference of incident positions on the dispersion device are passed through an one-dimensional Fourier transformation optical system so as to be converted into one-dimensional frequency light distributions having different incident angles depending on the incident positions on the dispersion device, the one-dimensional frequency light distributions is introduced into a nonlinear optical crystal, a second-harmonic which is generated by satisfying phase matching condition determined depending on an angle formed by the incident one-dimensional frequency light distributions is subjected to time-to-space conversion through an inverse one-dimensional Fourier transformation optical system so as to be converted to an one-dimensional space distribution, the time-to-space converted one-dimensional space distribution is converted into an one-dimensional space frequency distribution by an one-dimensional Fourier transformation optical system, the one-dimensional space frequency distribution is subjected to filtering by a time-space filter, light wave thus obtained is subjected to time-frequency expansion through an inverse one-dimensional Fourier transform optical system so as to obtain an intensity distribution of a two-dimensional light distribution, and the time-frequency expanded two-dimensional light distribution representing a relation between time and frequency of the signal pulse light is regarded as a two dimensional space signal.

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3. (Amended) The method for ultra-fast conversion of time signal into two-dimensional space signal according to claim 1, wherein space frequency filtering is employed as the time-frequency filter.

4. (New) The method for ultra-fast conversion of time signal into two-dimensional space signal according to claim 1, wherein the time-frequency filter has a different transmissivity distribution and a vertical cut out position of a space frequency component of a light wave outputted from the one-dimensional Fourier Transform light system is arbitrarily selected.

5. (New) The method for ultra-fast conversion of time signal into two-dimensional space signal according to claim 2, wherein space frequency filtering is employed as the time-frequency filter.

6. (New) The method for ultra-fast conversion of time signal into two-dimensional space signal according to claim 2, wherein the time-frequency filter has a different transmissivity distribution and a vertical cut out position of a space frequency component of a light wave outputted from the one-dimensional Fourier Transform light system is arbitrarily selected.

7. (New) The method for ultra-fast conversion of time signal into two-dimensional space signal according to claim 3, wherein the time-frequency filter has a different transmissivity distribution and a vertical cut out position of a space frequency component of a light wave outputted from the one-dimensional Fourier Transform light system is arbitrarily selected.